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EXAMINER	
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3676	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/711,918	TARVIN ET AL.	
	Examiner	**Art Unit**	
	Angela M. DiTrani	3676	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 October 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11,14-31,34-41 and 43-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11,14-31,34-41 and 43-48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. In view of the appeal brief filed on 08/04/08, PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:

/Jennifer H Gay/

Supervisory Patent Examiner, Art Unit 3676.

Claim Rejections - 35 USC § 102

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by C.K. Woodrow (SPE/IADC 67729 – cited in previous action).

With respect to independent claim 1, Woodrow discloses a method for analyzing distributed temperature data from a well, comprising: using a distributed temperature sensor system to obtain temperature profile data along a portion of a well bore; providing the temperature profile data to a processor; automatically determining whether fluids are flowing into or out of a tubing located in the well by processing the temperature profile data; and highlighting valuable information to a user related to the flow of fluid relative to the tubing (see entire document, especially sections **Principles of Operation, How it was deployed in Term Alpha Well A-27, Observed thermal profile during well kick-off**).

With respect to depending claim 21, the reference discloses wherein automatically determining occurs in real-time with the obtaining of data (**Observed thermal profile during well kick-off**, paragraph 4).

3. Claims 1, 6-8, 14, 21-26, 29, 31, 34-38, 46, and 48 are rejected under 35 U.S.C. 102(b) as being anticipated by Brown (WO 01/04581).

With respect to independent claim 1, Brown discloses a method for analyzing distributed temperature data from a well comprising: using a distributed temperature sensor system to obtain temperature profile data along a portion of a well bore; providing the temperature profile data to a processor; automatically determining whether fluids are flowing into or out of a tubing located in the well by processing the temperature profile data; and highlighting valuable information to a user related to the flow of fluid relative to the tubing (see entire disclosure, esp. p. 12, l. 27 – p. 16, l. 27).

With respect to depending claims 6-8, Brown discloses wherein automatically determining comprises applying a model-fitting algorithm to the data, and, further, wherein applying a model-fitting algorithm comprises selecting regions for fitting and fitting a model to data, wherein applying a model-fitting algorithm further comprises testing results for statistical significance (p. 9, l. 25 –p. 11, l. 5).

With respect to depending claim 14, Brown discloses wherein using comprises obtaining the temperature profile data with a temporary distributed temperature sensor installation (col. 13, l. 23-24).

With respect to depending claim 21, the reference discloses the automatically determining occurring in real-time (p. 4, l. 1-4; p. 11, l. 1-3; p. 16, l. 21-22).

With respect to independent claim 22, Brown discloses a system to analyze distributed temperature data from a well, comprising: a distributed temperature sensor that measures temperature profile data along a portion of a well bore; a processor that receives the temperature profile data in real time, the processor being programmed to identify a particular temperature signal that corresponds to a specific down hole event having an inflow of relatively cooler fluid; and wherein the processor outputs valuable information related to a specific down hole event to a user (see entire disclosure, esp. p. 12, l. 27 – p. 16, l. 27).

With respect to depending claims 23-26, and 29, the reference teaches wherein the distributed temperature system comprises an optical fiber, wherein the distributed temperature sensor comprises an opto-electronic unit to launch optical pulses downhole, wherein the opto-electronic unit is coupled to the processor by a

communication link, wherein the communication link comprises a hardline link, and a production tubing deployed in the wellbore with the optical fiber (p. 3, l. 1-6; p. 7, l. 11-29; p. 12, l. 27 - p. 13, l. 28).

With respect to independent claim 31, Brown discloses a method of detecting certain events within a well, comprising: using a distributed temperature sensor system to obtain data related to temperature over a period of time along a portion of a well bore; automatically processing the data to detect specific events related to heat energy in the well; further automatically processing the data to determine a flow rate of fluid in the well; and displaying results to a user (see esp. p. 12, l. 27 – p. 16, l. 27).

With respect to depending claims 34-38, the reference discloses automatically processing comprising processing the data on a processor-based computer, processing backscattered light signals, applying a model-fitting algorithm to the data, selecting regions for fitting and fitting a model to data, and testing for statistical significance (p. 3, l. 1-25; p. 7, l. 11 – p. 13, l. 28).

With respect to depending claim 46, Brown discloses displaying the results in graphical form on a display monitor (Fig. 2).

With respect to depending claim 48, the reference discloses the automatically determining occurring in real-time (p. 4, l. 1-4; p. 11, l. 1-3; p. 16, l. 21-22).

Claim Rejections - 35 USC § 103

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodrow as applied to claim 1 above, and further in view of Foster (US 3,275,980).

Woodrow discloses the method as stated above with respect to independent claim 1, and, further, wherein the temperature data can be displayed on-site, stored for later analysis or transmitted in real-time via modem or scada/modbus links to office based engineers and can then be interpreted using appropriate software applications. The reference, however, fails to explicitly disclose wherein automatically determining comprises removing noise from the temperature profile data as claimed in depending claim 2, as well as wherein automatically determining comprises utilizing a low-pass filter as claimed in depending claim 5.

Foster teaches a method for improving the resolution of geophysical data for the purpose of rendering the data more representative of a measured characteristic within a subsurface earth formation (col. 1, l. 9-39). Within the method, Foster teaches a noise removal system that takes the form of a low-pass filter for the purpose of removing noise spikes; the reference further teaches that noise must be removed prior to processing of the data, otherwise error will be introduced to the data (col. 4, l. 29-42). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to remove noise from the data obtained within the method of Woodrow, and, further, to utilize a low-pass filter in doing so, in order to obtain the most representative data of the measured characteristic, the distributed temperature, within the method of Woodrow, thereby eliminating extraneous and erroneous measurements obtained therein.

6. Claims 3 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodrow as applied to claim 1 above, and further in view of Van Bemmel et al. (US 6,201,884).

Woodrow discloses the method as stated above with respect to independent claim 1, and, further, wherein the temperature data can be displayed on-site, stored for later analysis or transmitted in real-time via modem or scada/modbus links to office based engineers and can then be interpreted using appropriate software applications. The reference, however, fails to explicitly disclose wherein automatically determining comprises removing low order spatial trends as claimed within claim 3 and the trend removal and filtering of the temperature profile data as claimed in claim 11.

Van Bemmel et al. teaches a method and apparatus for testing a large plurality of displayed data points of recorded spatial data for the purpose of determining and displaying trends created by different sets of data points within the recorded spatial data (abstract); the reference further provides for the teaching of employing the system within the field of oil exploration, wherein the spatial data obtained may be processed to find trends in the data (col. 24, l. 55-62). The reference further teaches the removal of trend lines displayed in the data (col. 25, l. 47-51). Although the reference does not explicitly state the removal of low order spatial trends, it would have been obvious to one having ordinary skill in the art to remove the those trends within the spatial data that are least indicative of the overall data trends therein, so as to obtain a more accurate data profile; therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to remove low order spatial trends as taught by Van Bemmel et

al. within the field of oil exploration, and, therefore, to try such a removal of low order spatial trends, thereby filtering the data, within the method of Woodrow in order to yield the predictable result of providing the most representative temperature data within the well bore to be processed and used in highlighting valuable information to a user.

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Woodrow as applied to claim 1 above, and further in view of Charske et al. (US 2,938,592).

Woodrow discloses the method as stated above with respect to independent claim 1, and, further, wherein the temperature data can be displayed on-site, stored for later analysis or transmitted in real-time via modem or scada/modbus links to office based engineers and can then be interpreted using appropriate software applications. The reference, however, fails to explicitly disclose wherein automatically determining comprises utilizing a high-pass filter.

Charske et al. teaches a method of obtaining data as a function of depth within a well bore (col. 1, l. 15-22) wherein the data signals are subjected to high-pass filtering for the purpose of attenuating sharply signal components having a frequency over that which is desired, thereby eliminating the response of the succeeding interval timing circuit to undesired low frequency noises unavoidably created within the well bore (col. 7, l. 5-23). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize a high-pass filter within the method of Woodrow in order to eliminate any extraneous and erroneous measurements, and, thereby provide the most representative data indicative of the distributed temperature profile of the well bore.

8. Claims 6-9 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodrow as applied to claim 1 above, and further in view of Brown.

Woodrow discloses the method with respect to independent claim 1 as stated above, and, further, wherein "The full implications of the tremendous temperature fluctuations observed in the annulus of TA-27 have yet to be fully understood as we have not yet established a thermal model that can accurately match the observed temperature profile had yet to be obtained" (p. 3, col. 2, paragraph 2). Woodrow further discloses future plans for additional thermal modeling study work utilizing commercially available software leading to direct gaslift and general well optimization in real time (p. 4). The reference, however, fails to explicitly teach wherein the automatically determining comprises applying a model-fitting algorithm to the data, and, further, wherein applying a model-fitting algorithm comprises selecting regions for fitting and fitting a model to data, further, wherein applying a model-fitting algorithm comprises testing results for statistical significance for the purpose of obtaining valuable information indicative of fluid flow relative to the tubing in the well bore, and, wherein applying a model-fitting algorithm comprises constructing a match filter and using extrema of a convolution of the filter with data to select candidate depths as claimed.

Brown teaches a distributed temperature system within a well bore wherein a model-fitting algorithm is applied to the data, wherein applying the model-fitting algorithm comprises selecting regions for fitting and fitting a model to data, and, further, wherein applying a model-fitting algorithm comprises testing results for statistical significance for the purpose of obtaining valuable information indicative of fluid flow

relative to the tubing in the well bore (see esp. p. 10-11). Since Woodrow discloses that the full implications of the data obtained therein had not yet been understood since a thermal model was yet to be established and Brown teaches the value of applying a model-fitting algorithm to the data, it would have been obvious to one having ordinary skill in the art at the time the invention was made to apply a model-fitting algorithm to the data obtained within the method of Woodrow as taught by Brown in order to provide one of ordinary skill with additional valuable information pertaining to the well and flow of fluids therein that can be used to enhance further operations therein.

With respect to depending claim 9, the combination is silent to the application of a model-fitting algorithm comprising constructing a match filter and using extrema of a convolution of the filter with data to select candidate depths. The Examiner hereby takes Official Notice in that it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct a match filter and to use extrema of a convolution of the filter with data to select candidate depths in order to enhance the model-fitting algorithm obtained therefrom.

With respect to depending claim 14, Woodrow fails to explicitly teach installation of a temporary distributed temperature sensor installation. Brown teaches the installation of sensors within a well as either permanently installed or conveyed into a measuring location by wireline (p. 2). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to employ the sensors of Woodrow as part of a temporary installation within those environments in which a

permanent installation of the distributed temperature sensor system therein is not desired.

9. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Woodrow.

Woodrow discloses the method with respect to independent claim 1 as stated above wherein the deployment method for the optical fibre distributed temperature system can be within the control line, externally on the outside of tubing, or run in and out of the well using typical wireline techniques (see **Principle of Operation**). The aforementioned section fails to explicitly disclose the wireline technique wherein the temperature profile data is obtained with a slickline distributed temperature sensing system. Woodrow, however, teaches prior art temperature measuring techniques wherein temperature is measured using production logging tools, run on slickline or electric line, and/or coiled tubing, for the purpose of continuously monitoring the wellhead temperature (see **Background**). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to deploy the optical fibre distributed temperature system using a "typical" wireline technique such as a slickline for the purpose of continuously obtaining temperature data.

10. Claims 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodrow as applied to claim 1 above, and further in view of Brune et al. (US 6,756,783).

Woodrow discloses the method as stated above with respect to independent claim 1, wherein temperature signals corresponding to particular downhole events, such

as the location of a gas lift valve, a hole in a tubing, and a leak in a well bore completion tool, is detected. Woodrow further discloses future plans for additional thermal modeling study work utilizing commercially available software leading to direct gaslift and general well optimization in real time (p. 4). The reference, however, fails to teach wherein automatically determining comprises utilizing a match filter, and further, wherein the match filter detects particular the temperature signals corresponding to the particular down hole events provided above.

Brune et al. teaches the use of a match filter for interpreting data that is used within a locating system for the purpose of providing a far less computationally complex approach to interpreting data signals, that, although described for use within drilling systems, is taught to enjoy wide application that is in no way limited to use in only drilling systems (col. 26, l. 35 – col. 28, l. 7; col. 31, l. 61-col. 32, l. 9). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide for optimization within the method of Woodrow wherein particular downhole events, such as the location of a gas lift valve, a hole in a tubing, and a leak in a well bore completion tool, can be detected, by employing a match filter therein so as to provide a more efficient means to interpret the data that is less complex.

11. Claims 10 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodrow in view of Brown and Brune et al..

With respect to independent claim 10, Woodrow discloses a method for analyzing distributed temperature data from a well, comprising: obtaining temperature profile data along a portion of a well bore; providing the temperature profile data to a

processor; and automatically processing the temperature profile data to highlight valuable information to a user.

With respect to independent claim 40, Woodrow discloses a method of detecting certain events within a well, comprising: obtaining data over a period of time along a portion of a well bore; automatically processing the data to detect specific events related to heat energy in the well; and displaying results to a user (see entire document, especially sections **Principles of Operation**, **How it was deployed in Term Alpha Well A-27**, **Observed thermal profile during well kick-off**).

Woodrow further discloses wherein "The full implications of the tremendous temperature fluctuations observed in the annulus of TA-27 have yet to be fully understood as we have not yet established a thermal model that can accurately match the observed temperature profile had yet to be obtained" (p. 3, col. 2, paragraph 2) and that future plans for additional thermal modeling study work utilizing commercially available software leading to direct gaslift and general well optimization in real time (p. 4). The reference, however, fails to explicitly teach wherein the automatically determining comprises applying a model-fitting algorithm to the data as claimed within both claims 10 and 40.

Brown teaches a distributed temperature system within a well bore wherein a model-fitting algorithm is applied to the data, for the purpose of obtaining valuable information indicative of fluid flow relative to the tubing in the well bore (see esp. p. 10-11). Since Woodrow discloses that the full implications of the data obtained therein had not yet been understood since a thermal model was yet to be established and Brown

teaches the value of applying a model-fitting algorithm to the data, it would have been obvious to one having ordinary skill in the art at the time the invention was made to apply a model-fitting algorithm to the data obtained within the method of Woodrow as taught by Brown in order to provide one of ordinary skill with additional valuable information pertaining to the well and flow of fluids therein that can be used to enhance further operations therein.

Although Brown teaches various calibration of data within application and determination of the model fitting algorithm, the combination of Woodrow in view of Brown is silent to the construction of a match filter, and, further, wherein constructing the match filter comprises incorporating modifications to the filter to make it orthogonal to background trends.

Brune et al. teaches the use of a match filter for interpreting data that is used within a locating system for the purpose of providing a far less computationally complex approach to interpreting data signals, that, although described for use within drilling systems, is taught to enjoy wide application that is in no way limited to use in only drilling systems (col. 26, l. 35 – col. 28, l. 7; col. 31, l. 61-col. 32, l. 9). The reference further provides for a calibration procedure wherein orthogonal axes can be located and data obtained can be transformed mathematically into any desired direction (col. 15, l. 15-40). Since Brown teaches calibration within application of the model-fitting algorithm, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide for a match filter as taught by Brune et al. to interpret the data signals within the application of a model-fitting algorithm of Woodrow in view of

Brown, and further, to provide for the incorporation of modifications into the filter to make it orthogonal to background trends in order to provide calibration therein.

12. Claims 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brown as applied to claim 1 above, and further in view of Foster.

Brown discloses the method as stated above with respect to independent claim 1, and, further, wherein multiple measurements of at a plurality of locations may be made so that the results art not critically dependent upon one set of data. The reference, however, fails to explicitly disclose wherein automatically determining comprises removing noise from the temperature profile data as claimed in depending claim 2, as well as wherein automatically determining comprises utilizing a low-pass filter as claimed in depending claim 5.

Foster teaches a method for improving the resolution of geophysical data for the purpose of rendering the data more representative of a measured characteristic within a subsurface earth formation (col. 1, l. 9-39). Within the method, Foster teaches a noise removal system that takes the form of a low-pass filter for the purpose of removing noise spikes; the reference further teaches that noise must be removed prior to processing of the data, otherwise error will be introduced to the data (col. 4, l. 29-42). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to remove noise from the data obtained within the method of Brown, and, further, to utilize a low-pass filter in doing so, in order to obtain the most representative data of the measured characteristics therein, the distributed temperature,

thereby eliminating extraneous and erroneous measurements that would inaccurately depict the conditions within the well bore.

13. Claims 3 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brown as applied to claim 1 above, and further in view of Van Bemmel et al..

Brown discloses the method as stated above with respect to independent claim 1, and, further, wherein multiple measurements of at a plurality of locations may be made so that the results art not critically dependent upon one set of data. The reference further provides for a calibration period, as well as application of an algorithm and least squares regression fit of the data. The reference, however, fails to explicitly disclose wherein automatically determining comprises removing low order spatial trends within the data as claimed within claim 3 and the trend removal and filtering of the temperature profile data as claimed in claim 11.

Van Bemmel et al. teaches a method and apparatus for testing a large plurality of displayed data points of recorded spatial data for the purpose of determining and displaying trends created by different sets of data points within the recorded spatial data (abstract); the reference further provides for the teaching of employing the system within the field of oil exploration, wherein the spatial data obtained may be processed to find trends in the data (col. 24, l. 55-62). The reference further teaches the removal of trend lines displayed in the data (col. 25, l. 47-51). Although Van Bemmel et al. does not explicitly state the removal of low order spatial trends, it would have been obvious to one having ordinary skill in the art to remove the those trends within the spatial data that are least indicative of the overall data trends therein, so as to obtain a more accurate

data profile; therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to remove low order spatial trends as taught by Van Bemmel et al. within the field of oil exploration, and, therefore, to try such a removal of low order spatial trends, thereby filtering the data, within the method of Brown in order to yield the predictable result of providing the most representative data within the well bore to be processed and used in highlighting valuable information to a user.

14. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brown as applied to claim 1 above, and further in view of Charske et al..

Brown discloses the method as stated above with respect to independent claim 1, and, further, wherein multiple measurements of at a plurality of locations may be made so that the results art not critically dependent upon one set of data. The reference, however, fails to explicitly disclose wherein automatically determining comprises utilizing a high-pass filter.

Charske et al. teaches a method of obtaining data as a function of depth within a well bore (col. 1, l. 15-22) wherein the data signals are subjected to high-pass filtering for the purpose of attenuating sharply signal components having a frequency over that which is desired, thereby eliminating the response of the succeeding interval timing circuit to undesired low frequency noises unavoidably created within the well bore (col. 7, l. 5-23). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize a high-pass filter within the method of Brown in order to eliminate any extraneous and erroneous measurements, and, thereby

provide the most representative data indicative of the distributed temperature profile of the well bore.

15. Claims 9, 15, 28, and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brown.

With respect to depending claim 9 and 39, Brown is silent to the application of a model-fitting algorithm comprising constructing a match filter and using extrema of a convolution of the filter with data to select candidate depths. The Examiner hereby takes Official Notice in that it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct a match filter and to use extrema of a convolution of the filter with data to select candidate depths in order to enhance the model-fitting algorithm obtained therefrom.

With respect to depending claim 15, Brown is silent to the obtainment of the temperature profile data with a slickline distributed temperature sensing system. The Examiner hereby takes Official Notice in that it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a slickline distributed temperature sensing system insofar as because the use of a slickline to deploy temperature sensing equipment is well known within the art.

With respect to depending claim 28, although Brown discloses the use of a data processing unit at the well site, the reference fails to explicitly teach the processor as a portable computer. It would have been obvious to one having ordinary skill in the art at the time the invention was made to employ a portable computer for the processor in

order to use the computer at a different location upon completion of the deployment of the distributed temperature system within the well in which the system is initially used.

16. Claims 16-20 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brown as applied to claims 1 and 31 above, and further in view of Brune et al..

Brown teaches the method as stated above with respect to independent claims 1 and 31 wherein the data obtained is calibrated and temperature signals corresponding to particular downhole events corresponding to fluid flow within producing oil, water, and gas wells, wherein the data can be used to adjust or improve flow rates, to diagnose immediate or potential problems, or to trigger alarms (p. 1, l. 15-20). The reference, however, fails to teach wherein automatically determining comprises utilizing a match filter, and further, wherein the match filter detects particular the temperature signals corresponding to particular down hole events.

Brune et al. teaches the use of a match filter for interpreting data that is used within a locating system for the purpose of providing a far less computationally complex approach to interpreting data signals, that, although described for use within drilling systems, is taught to enjoy wide application that is in no way limited to use in only drilling systems (col. 26, l. 35 – col. 28, l. 7; col. 31, l. 61-col. 32, l. 9). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide for optimization within the method of Brown wherein particular downhole events that may be used to adjust or improve flow rates, to diagnose immediate or potential problems, or to trigger alarms, such as the location of a gas lift

valve, a hole in a tubing, and a leak in a well bore completion tool, by employing a match filter therein so as to provide a more efficient means to interpret the data.

17. Claims 30 and 43-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brown as applied to claims 22, 23, 29, and 31 above, and further in view of Woodrow.

With respect to depending claim 30, Brown discloses the use of system within producing oil, water and gas wells (p. 7, l. 24-28). The reference further provides for the use of the obtained data to actively adjust or improve flow rate, to diagnose immediate or potential problems, or to trigger alarms (p. 1, l. 15-20). The reference, however, fails to explicitly teach the production tubing combined with a gas lift system as claimed in depending claim 30, as well as wherein automatically processing comprises detecting the location of a gas lift valve, a well completion tool leak, and a hole in a production tubing as claimed in claims 43-45. Woodrow teaches the use of a distributed temperature system within a gas lift system for the purpose of determining the opening and closing of gaslift valves which can be seen through the Joule Thomson effect of gas passing through the valves. The reference further provides for the use of distributed temperature data as having potential to detect a leak quickly and accurately. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to employ the production tubing of Brown in combination with a gas lift system in order to determine the passage of gas therethrough, as well as to use the data obtained from the system of Brown to actively diagnose immediate or potential problems such as the location of a gas lift valve, a well bore completion tool leak, or a

hole in production tubing insofar as because as taught by Woodrow, it is known within the art to detect such problems using distributed temperature data, and the method of Brown can be used to promptly remediate such problems.

18. Claims 10 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brown in view of Brune et al..

With respect to independent claim 10, Brown discloses a method for analyzing distributed temperature data from a well, comprising: obtaining temperature profile data along a portion of a well bore; providing the temperature profile data to a processor; and automatically processing the temperature profile data to highlight valuable information to a user.

With respect to independent claim 40, Brown discloses a method of detecting certain events within a well, comprising: obtaining data over a period of time along a portion of a well bore; automatically processing the data to detect specific events related to heat energy in the well; and displaying results to a user (see entire disclosure, esp. p. 12, l. 27 – p. 16, l. 27).

Although Brown teaches various calibration of data within application and determination of the model fitting algorithm, the reference is silent to the construction of a match filter, and, further, wherein constructing the match filter comprises incorporating modifications to the filter to make it orthogonal to background trends.

Brune et al. teaches the use of a match filter for interpreting data that is used within a locating system for the purpose of providing a far less computationally complex approach to interpreting data signals, that, although described for use within drilling

systems, is taught to enjoy wide application that is in no way limited to use in only drilling systems (col. 26, l. 35 – col. 28, l. 7; col. 31, l. 61-col. 32, l. 9). The reference further provides for a calibration procedure wherein orthogonal axes can be located and data obtained can be transformed mathematically into any desired direction (col. 15, l. 15-40). Since Brown teaches calibration within application of the model-fitting algorithm, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide for a match filter as taught by Brune et al. to interpret the data signals within the application of a model-fitting algorithm, and further, to provide for the incorporation of modifications into the filter to make it orthogonal to background trends in order to provide the calibration therein.

19. Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brown as applied to claim 31 above, and, further, in view of Tubel (US 6,012,015 - cited in previous action).

Brown discloses the method with respect to claim 31 as stated above wherein a model may be applied to the data. The reference, however, fails to teach automatically processing comprising applying a phenomenological model to the data. Tubel teaches a downhole production well control system in which sensors are employed, and, wherein models, such as phenomenological models, are employed for the purpose of combining knowledge obtained from the system with a model for the purpose of obtaining optimum operating parameters for the process and improving the performance therein (see col. 6, lines 25-57). Therefore, it would have been obvious to one having

ordinary skill in the art at the time the invention was made to look to a phenomenological model to enhance the modeling techniques employed by Brown.

Response to Arguments

20. Applicant's arguments filed 08/04/08 with respect to the rejection of independent claims 1 and 21 have been fully considered but they are not persuasive.

Applicant presents that the Woodrow reference fails to disclose or suggest "automatically determining whether fluids are flowing into or out of a tubing located in the well by processing the temperature profile data." The Examiner disagrees. As previously recited, the temperature data obtained when employing the method of Woodrow "can be displayed on-site, stored for later analysis or transmitted in real-time via modem or scada/modbus links to office based engineers." This extracted raw data can then be "processed" to generate a graph that indicates the thermal profile of the well bore and the various thermal profiles obtained following initial kick-off. By "processing" the data to generate the temperature profiles, one of ordinary skill in the art is provided with a graph, as shown in Fig. 4, from which one can "automatically determine" whether fluids are flowing into or out of a tubing. For example, within Fig. 4, at a well depth of 2,640 meters, one can see that there is a spike within the temperature profile, thereby enabling one of ordinary skill to "automatically determine" the flow of fluid into or out of the tubing. This "automatic determination" is further disclosed by Woodrow in the paragraph following Fig. 4; "These profiles clearly show the gaslift valves opening and closing, and the significant Joule Thomson effect of the gas passing through the operating valve at 2,640 metres." Woodrow further provides that the

distributed temperature system can generate a full well bore thermal profile every half four and these can be observed in real time, thereby disclosing "wherein the automatically determining occurs in real-time with the obtaining of data" as presently claimed within depending claim 21 (see **Observed thermal profile during well kick-off** and Fig. 4).

Applicant further presents that Woodrow states that the data displayed in each of the two graphs within the reference is raw, un-processed data extracted from the distributed temperature system. The Examiner disagrees. Although Woodrow discloses that the graph shows raw data, the data is extracted from the distributed temperature system and graphed to generate a temperature profile, and, therefore, is "processed."

With respect to Applicant's argument that there is no automatic determining of the fluid flow into and out of the tubing, the Examiner disagrees. As previously stated, from the temperature profile, one of ordinary skill can determine, automatically, upon detection of a deviation therein, whether gas lift valves are opening and closing, enabling gas to flow through the operating valve, and, therefore, into and out of the tubing. The claims do not require that the "automatic determining" be done by a processor, i.e. that the processor tell the user specifically where the fluid flow into or out of the tubing is.

Applicant further presents that the reference fails to disclose “highlighting valuable information to a user related to the flow of fluid relative to the tubing" and that the graph shown in Fig. 4 was manually interpreted by an engineer as showing the

gaslift valves opening and closing. Applicant further argues that none of the information is highlighted or indicated as such on the graph. The Examiner disagrees. Although an engineer is interpreting the graph, upon noticing the deviation within the temperature profile such as that indicated at 2,640 meters, the engineer can "automatically determine" that the gaslift valves are opening and closing, thereby "highlighting" the passage of gas through the operating valve to the user.

21. Applicant's arguments with respect to claims 2-9, 11, 14, 16-20, have been considered but are moot in view of the new ground(s) of rejection.

22. Applicant's arguments with respect to claims 22-30, 31, 34-39, and 43-48, have been considered but are moot in view of the new ground(s) of rejection.

23. Applicant's arguments with respect to claims 10 and 40 have been considered but are moot in view of the new ground(s) of rejection.

24. Applicant's arguments with respect to depending claim 15 have been fully considered but they are not persuasive. Applicant presents that claim 15 depends directly from claim 1 and is patentable over Woodrow for the reasons provided with respect to independent claim 1 as well as the additional unique subject matter of dependent claim 15. Since no further arguments were presented with respect to the additional subject matter of dependent claim 15, the Examiner would like to direct Applicant's attention to the response to the rejection of claim 1 above.

25. Applicant's arguments with respect to claim 41 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Angela M. DiTrani whose telephone number is (571)272-2182. The examiner can normally be reached on M-F, 6:30AM-4:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer Gay can be reached on (571)272-7029. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jennifer H Gay/
Supervisory Patent Examiner, Art Unit 3676

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01/16/09